study of phenomena for the very sufficient reason that they can never get at anything else. In justice to the author, however, it must be said that he several times gives pretty distinct evidence that he has never quite grasped the question at issue between our modern realists and idealists. Compare the following sentences with the one just criticised :—"Light, heat, electricity, force, *as studied by physicists, are non-phenomenal powers*, and the object of science is to ascertain their laws and relations." "Realism, as found in Herbert Spencer, *and as supported by recent investigations of science*, demands a belief in real objective non-phenomenal forces." Mr. Jardine does not tell us, and we cannot conceive, what recent scientific investigations he could have been thinking of; but that he should suppose that Mr. Spencer's doctrine of the unknowable could be supported by any recent discoveries, or by anything ever to be discovered, shows conclusively that he has still to learn what that doctrine really is.

We agree with Mr. Jardine in rejecting the idealism of Mr. Mill; and we must say that some of Mr. Jardine's criticisms are very happy. Here is an example. Mr. Mill says that the possibilities of sensation that make up a given group "are conceived as standing to the actual sensations in the relation of a cause to its effects." On this Mr. Jardine remarks: "We have, for example, the sensation of a particular figured colour, which is associated with the name orange. Connected with this sensation there are a number of possible sensations of smell, taste, touch, sound, &c. *The possibility of those sensations is the cause of the colour.* What does this mean? Is the possibility of a smell the cause of a colour? Is the possibility of a taste the cause of a colour? Or is the possibility of all the other sensations of the group taken together the cause of colour?" No doubt some of Mr. Mill's disciples may object that Mr. Jardine has misunderstood Mr. Mill; they will, however, find it hard to give any definite meaning to the words of their master without either making him a realist or letting in some such criticism as the above.

But though we cannot always agree with Mr. Mill, we can never think of him without feelings of profound admiration and respect. We have therefore no sympathy with Mr. Jardine when he tells us how easy it is "to show the absurdity" of Mr. Mill's attempt to explain our notion of extension. A more modest self-appreciation in the presence of Mr. Mill would have been becoming; the more so as Mr. Jardine has none of that cleverness of expression which may at times do something to cover the audacity of the critic. Mr. Mill will not fall before the word "absurdity"; and Mr. G. H. Lewes will not be seriously damaged by being loosely classed with "a set of visionary speculators called phrenologists," who, acting upon a "hasty and crude hypothesis," have made a very great blunder.

There only remains to say that Mr. Jardine seems to be himself unacquainted with the psychology of our own day. He may sneer at Mr. Lewes for giving "prominence to the study of physiology as a means of becoming acquainted with mental laws," but if he would entitle himself even to a hearing, he must, as a first condition, make himself master of the knowledge that has been laboriously acquired by the school of investigators to which Mr. Lewes belongs.

DOUGLAS A. SPALDING

WHITE'S "SELBORNE"

White's Natural History of Selborne. Edited by J. E. Harting, F.L.S. Illustrated by Bewick. (London: Bickers and Co., 1875.)

ALTHOUGH we have no evidence that, within the last century, there has been any considerable change in the average standard of human mental power amongst civilised nations, the surroundings of every-day life have so greatly altered, both in their quality and in the rapidity of their occurrence, that the standard of ordinary existence has undergone a corresponding modification. The introduction of steam locomotion, the electric telegraph, and the penny post have developed such a condition of unrest in humanity at large that the unalloyed repose of a continuous rural life is rarely sought for, and as infrequently obtainable. We can hardly conceive it possible that anyone, such as a life-fellow of a college, as was Gilbert White, of Oriel, Oxford, should at the present day settle down in any out-of-the-way part of the country, satisfied with nothing more than an opportunity of observing and recording the surrounding phenomena of nature. More would be expected of him, and he would be continually led to feel that he was but one of the instances of the vegetating influence of an antiquated system, whose advantages were being daily disproved by his individual existence.

The same influences have affected the mental world. Facts have a less intrinsic value than they used to have in the time of Gilbert White, the Addison of natural phenomena. More must now be extracted from them in their mutual relations. They must be manipulated into the web of some inclusive hypothesis, or otherwise they may as well die an unrecorded death, because their independence only helps to block the already but too narrow path which leads towards omniscience. In this period of revulsion against encyclopædic knowledge, a remark by the author of the work before us, when writing of the otter, indicates a tenour of thought which is antiquated, to say the least. "Not supposing that we had any of those beasts in our shallow brooks, I was much pleased to see a male otter brought to me, weighing twenty-one pounds, that had been shot on the bank of our stream below the Priory, where the rivulet divides the parish of Selborne from Harteley Wood." No inference is drawn, no comment made; whence the source of pleasure?

We cannot well conceive a more efficient editor, at the present time, than Mr. Harting. That author's considerable experience and his great love for the study of the ornithic fauna of the British Isles has already made his name well known in connection with the birds which reside amongst us, and those which visit our shores. He also tells us in his preface, as may be equally well inferred from his annotations throughout the work, that he is well acquainted with the neighbourhood of Selborne, which enables him to correct a few of Gilbert White's inaccuracies, and bring to the foreground those slight changes in the fauna and flora of the district which have occurred since the book was originally written. Amongst the latter, special attention is directed to the reintroduction into Wolmer Forest, by Sir Charles Taylor, of black game, "which I (Gilbert White) have heard old people say abounded much before shooting flying became so com-

mon"; and the non-applicability to present visitors to the Devil's Dyke, of the remark that "there are bustards on the wide downs near Brighthelmstone"; and to those who spend their summer at Eastbourne, that "Cornish choughs abound and breed on Beachy Head, and on all the cliffs of the Sussex coast." A lengthy list of references is given with regard to the habits of the cuckoo, a subject on which further reliable information is much needed.

The typography, paper, and binding of the work are all that can be desired, and Bewick's drawings add further to its general interest.

OUR BOOK SHELF

Microscopical Notes regarding the Fungi present in Opium Blight. By D. D. Cunningham, M.B., Surgeon H.M. Indian Medical Service. (Calcutta: Office of the Superintendent of Government Printing. 1875.)

DR. CUNNINGHAM has devoted much care and attention to the study of the fungi present in the opium blight, and the results of his labours are given in the present pamphlet. The most important fungus present, and the one really causing the blight, is a species of Peronospora, and thus belongs to the same genus as our own too well-known potato-disease fungus. As in India the Peronospora affects the opium crop very seriously, it is a matter of the highest importance to have the life-history of such a pest worked out thoroughly by a competent observer. The *Peronospora arborescens*, which in India attacks the opium poppy, is to be met with in this country on the red poppy (*Papaver Rhœas*). Dr. Cunningham invariably found the Peronospora present in blighted leaves, and he describes fully the mycelium and the conidia of the fungus. The mycelium spreads through the intercellular spaces of the leaf, branches coming to the surface through the stomata, which ramify and produce the conidia. The conidia apparently do not produce zoospores. The sexual mode of reproduction by antheridia and oogonia was not observed, even although De Bary has already described the oogonia of this fungus. The life-history thus is imperfect, and we must urge Dr. Cunningham to persevere and not rest satisfied until he has observed the whole of the stages of this fungus.

After the parasite has done its work, the leaves of the poppy become infested with a number of other fungi, chiefly saprophytes, and Dr. Cunningham carefully describes and figures several of the forms.

W. R. M'NAB

Logarithmic and Trigonometrical Tables for Approximate Calculation. By J. T. Bottomley, M.A., F.R.S.E. (London and Glasgow: Collins and Co., 1875.)

THESE tables were primarily arranged by Mr. Bottomley for the use of the students of the Natural Philosophy Class in Glasgow University, but we believe many other students will feel grateful to the author for having published them.

An easy, handy book of tables such as this has been much wanted for Mathematical and Natural Philosophy Classes in the Universities and for advanced schools. There is no reason why, with a really convenient book, boys should not all learn logarithmic arithmetic as soon as they know decimals. But the books hitherto in use are too formidable. Moreover, practical calculators will find much use for four-figure logarithms, sines, &c., and many people who never use logarithms will be able to do so with ease when they have a four-figure table.

Mr. Bottomley has in this manual arranged (on the plan of De Morgan, we believe, who first applied it to logarithms) sines, tangents, logarithmic sines, and logarithmic tangents, and has printed them, with the logarithms and antilogarithms, each table on *two facing pages*.

We heartily approve of Mr. Bottomley's plan, and recommend his manual to all teachers and students who wish for an easily consulted scientific ready reckoner.

LETTERS TO THE EDITOR

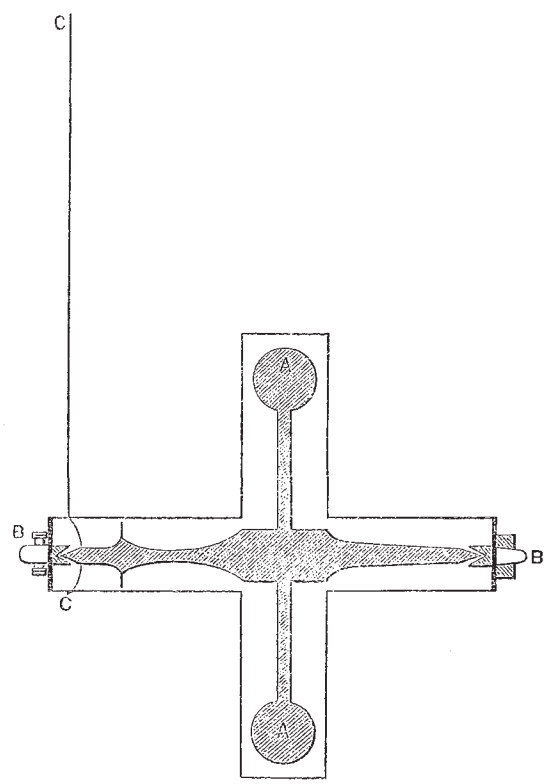
[*The Editor does not hold himself responsible for opinions extressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

A Gyrostat Problem.*—Answer

LET W be the weight of the fly-wheel.
k its radius of gyration.
ω its angular velocity in radians per second.
W' the weight of wheel and case together.
a the distance from the centre of inertia to the point of attachment of the string.
g the force of gravity.

The moment of momentum of the wheel round its axis is $\omega W k^2$.

The rate of generation of moment of momentum round a horizontal axis perpendicular to the axis of the wheel, by the couple produced by the action of gravity and the tension of the cord by which the gyrostat is suspended, is equal to the moment



of the couple (see Thomson and Tait's "Elements of Natural Philosophy," § 236), and is therefore, $g W' a$. Therefore the moment of momentum generated in a small time τ is $g W' a \tau$.

Compounding these two moments of momentum by the parallelogram of moments, we obtain—

$$\tan\theta = \frac{g W' a \tau}{\omega W k^2}$$

where θ is the angle described in azimuth by the axis of the wheel in the small time τ; and since, when θ is small, $\tan\theta = \theta$, we have by the question—

$$\frac{g W' a \tau}{\omega W k^2} = \tfrac{1}{4}\tau$$

* For Problem, see NATURE, vol. xi. p. 385.